

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
28 February 2002 (28.02.2002)

PCT

(10) International Publication Number
WO 02/16206 A1

(51) International Patent Classification⁷: **B65B 9/04**, 31/00, B65D 65/46

(21) International Application Number: PCT/GB01/03825

(22) International Filing Date: 23 August 2001 (23.08.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0021112.8 25 August 2000 (25.08.2000) GB

(71) Applicant (for all designated States except US): RECKITT BENCKISER (UK) LIMITED [GB/GB]; 103-105 Bath Road, Slough, Berkshire SL1 3UH (GB).

(72) Inventor; and

(75) Inventor/Applicant (for US only): HAMMOND, Geoffrey, Robert [GB/GB]; 574 James Reckitt Avenue, Hull, East Yorkshire HU8 0LG (GB).

(74) Agents: DICKSON, Elizabeth, Anne et al.; Reckitt Benckiser plc, Group Patents Dept., Dansom Lane, Hull HU8 7DS (GB).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SB, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 02/16206 A1

(54) Title: WATER-SOLUBLE CONTAINERS

(57) Abstract: A process for producing an inflated, water-soluble container which comprises: a) forming an open container from a water-soluble film; b) at least partially filling the container with a composition which comprises a component which releases a gas; c) sealing the container; and d) allowing the container to inflate.

- 1 -

WATER-SOLUBLE CONTAINERS

The present invention relates to inflated, water-soluble containers and to a process for their preparation.

5

It is known to package chemical compositions which may be of a hazardous or irritant nature in water-soluble or water-dispersible materials such as films. The package can simply be added to water in order to dissolve or 10 disperse the contents of the package into the water.

For example, WO 89/12587 discloses a package which comprises an envelope of a water-soluble or water dispersible material which comprises a flexible wall and 15 a water-soluble or water-dispersible heat seal. The package may contain an organic liquid comprising, for example, a pesticide, fungicide, insecticide or herbicide.

20 It is also known to package detergents in water-soluble or water-dispersible containers. For example, WO 94/14941 discloses a water-soluble or water-dispersible capsule containing an aqueous dishwasher detergent. The capsule is made of gelatin.

25

CA-A-1,112,534 discloses a packet made of a water-soluble material in film form enclosing within it a paste-form, automatic dishwasher-compatible detergent composition. The water-soluble material may be, for 30 example, poly(vinyl alcohol), polyethylene oxide or methyl cellulose. Example 1 illustrates an embodiment

wherein a poly(vinyl alcohol) (PVOH) film is made into a 5cm square packet by heat sealing its edges, and the packet is filled with a composition which contains 8.5 wt.% water.

5

It is also known to form water-soluble containers by thermoforming a water-soluble material. For example, WO 92/17382 discloses a package containing an agrochemical such as a pesticide comprising a first sheet of non-planar water-soluble or water-dispersible material and a second sheet of water-soluble or water-dispersible material superposed on the first sheet and sealed to it by a continuous closed water-soluble or water-dispersible seal along a continuous region of the superposed sheets. It is stated to be advantageous to ensure that the package produced is evacuated of air or the contents are under reduced pressure to provide increased resistance to shock.

20 In order to improve the strength of packages containing liquids, it is also known to provide the package with residual inflatability. Thus, for example, EP-A-524,721 describes a water-soluble package which contains a liquid, wherein the package is inflatable to a volume which is greater than the initial volume of the package. Thus the package is filled to less than its complete capacity, and the unused capacity may be partially, but not totally, filled with a gas such as air. The unused capacity which does not contain gas provides the residual inflatability.

In fields such as detergents for domestic use, an attractive appearance for an article is extremely desirable. However, in the prior art such as that described above, the packages do not have an attractive 5 appearance. For example, the packages disclosed in WO 92/17382 are likely to have a non-uniform appearance because they are packaged under reduced pressure. When a bag is formed from a single sheet of water-soluble film by folding the film and heat-sealing the edges to 10 form the bag, which is then filled, such as described in CA-A-1,112,534, the product obtained can be a rather flat, limp envelope containing the product. Again there may also be lack of uniformity between different bags 15 because of their flexible nature.

15

We have discovered that this type of product is not deemed to be attractive by an average consumer.

The present invention seeks to provide a water-soluble 20 container containing a composition, which container has a more attractive appearance. In particular the container should be relatively self-supporting and look full. Ideally the container should have an attractive, rounded three-dimensional appearance.

25

EP-A-654,418 describes self-standing flexible pouches which may contain, for example, liquid detergent compositions for refilling other containers. The pouches are cut open and the contents poured into the 30 containers to be refilled. Thus they are not water-soluble. In order to avoid folding of the pouches,

- 4 -

which can lead to cracking and leakage, the pouches are inflated by pumping in air before they are sealed.

We have now surprisingly discovered a water-soluble
5 container which contains a composition having an
attractive three-dimensional appearance by ensuring that
the container is inflated after it has been sealed.

The present invention accordingly provides a process for
10 producing an inflated, water-soluble container which
comprises:

- a) forming an open container from a water-soluble
film;
- b) at least partially filling the container with a
15 composition which comprises a component which
releases a gas;
- c) sealing the container; and
- d) allowing the container to inflate.

20 The present invention also provides an inflated water-soluble container comprising a water-soluble film enclosing a liquid or solid composition and a gas, wherein the gas is enriched with at least one gaseous component as compared with air or comprises at least one
25 gaseous component not normally present in air.

The initial step (a) of the process of the invention comprises forming an open container from a water-soluble film. A suitable water-soluble film is a poly(vinyl
30 alcohol) (PVOH) film.

- 5 -

The PVOH film may be partially or fully alcoholised or hydrolysed, for example, it may be from 40 to 100%, preferably 70 to 92%, more preferably about 88% or about 92%, alcoholised or hydrolysed, polyvinyl acetate film.

- 5 The degree of hydrolysis is known to influence the temperature at which the PVOH starts to dissolve in water. 88% hydrolysis corresponds to a film soluble in cold (i.e. room temperature) water whereas 92% hydrolysis corresponds to a film soluble in warm water.
- 10 An example of a preferred PVOH is ethoxylated PVOH. The film may be cast, blown or extruded. It may also be unorientated, mono-axially oriented or bi-axially oriented.
- 15 The film may also comprise a cellulose derivative such as hydroxy propyl methyl cellulose (HPMC). A suitable HPMC is, for example, M900 obtained from Enak Ltd.

It is possible for suitable additives such as

- 20 plasticisers, lubricants and colouring agents to be added to the film. Components which modify the properties of the polymer may also be added. Plasticisers are generally used in an amount of up to 35 wt%, for example from 5 to 35 wt%, preferably from 7 to
- 25 20 wt%, more preferably from 10 to 15 wt%. Lubricants are generally used in an amount of 0.5 to 5 wt%. The polymer is therefore generally used in an amount of from 60 to 94.5 wt%, based on the total amount of the composition used to form the film. Suitable
- 30 plasticisers are, for example, pentaerythritols such as depentaerythritol, sorbitol, mannitol, glycerine and

- 6 -

glycols such as glycerol, ethylene glycol and polyethylene glycol. Solids such as talc, stearic acid, magnesium stearate, silicon dioxide, zinc stearate or colloidal silica may also be used.

5

It is also possible to include one or more particulate solids in the films in order to accelerate the rate of dissolution of the container. This solid may also be present in the contents of the container. Dissolution 10 of the solid in water is sufficient to cause an acceleration in the break-up of the container, particularly if a gas is generated, when the physical agitation caused may, for example, result in the virtually immediate release of the contents from the 15 container. Examples of such solids are alkali or alkaline earth metal, such as sodium, potassium, magnesium or calcium, bicarbonate or carbonate, in conjunction with an acid. Suitable acids are, for example, acidic substances having carboxylic or sulfonic 20 acid groups or salts thereof. Examples are cinnamic, tartaric, mandelic, fumaric, maleic, malic, palmoic, citric and naphthalene disulfonic acids.

The film is generally cold water (20°C) soluble, but may 25 be insoluble in cold water at 20°C and only become soluble in warm water or hot water having a temperature of, for example, 30°C, 40°C, 50°C or even 60°C. This parameter is determined in the case of PVOH by its degree of hydrolysis.

30

It is particularly important to avoid pinholes in the film through which leakage of the contained composition may occur. It may therefore be appropriate to use a laminate of two or more layers of a different or the 5 same film, as pinholes are unlikely to coincide in two layers of material.

The open container may be formed by any means. For example, it may be formed by thermoforming a PVOH film 10 to produce a non-planar sheet containing a pocket, such as a recess, which is able to retain the composition. The pocket is generally bounded by a flange, which is preferably substantially planar. The pocket may have internal barrier layers as described in, for example, WO 15 93/08095. Thus the container may be formed, for example, by a process which is similar to that disclosed in WO 92/17382.

Alternatively the container may be prepared by producing 20 an open-top bag by forming a film around a shoulder and then heat-sealing simultaneously the bottom and sides of the bag. Other methods of sealing may be used, for example infra-red, radio frequency, ultrasonic, laser, solvent, vibration, electromagnetic, hot gas, hot plate, 25 insert bonding, friction sealing or spin welding. An adhesive such as water or an aqueous solution of PVOH may also be used. The adhesive can be applied to the film by spraying, transfer coating, roller coating, or the film can be passed through a mist of the adhesive. 30 The seal desirably is also water-soluble. Such a process is described for example in EP-A-728,673.

Another method for forming the open container is to seal two films together on three sides of the pocket by superimposing the films on each other and sealing them 5 together as described in WO 95/23099.

When a single water-soluble film is used, or if two films are used which are not thermoformed, the films generally have a thickness of 20 to 500 μm , especially 10 30 to 160 μm , preferably from 40 to 120 μm , more preferably from 50 to 100 μm .

When a first and second water-soluble film are used to form the containers of the present invention, the first 15 film will generally have a thickness before thermoforming of 20 to 500 μm , especially 70 to 400 μm , for example 70 to 300 μm , most preferably 70 to 160 μm , especially 75 to 100 μm or 90 to 110 to 150 μm . The thickness of the second film may be less than that of 20 the first film as the second film will not generally be thermoformed so localised thinning of the sheet will not occur. The thickness of the second film will generally be from 20 to 150 μm or 160 μm , preferably from 40 or 50 to 90 or 100 μm , more preferably from 50 to 80 μm . 25 The films may be chosen, if desired, such that they have the same thickness before the first film is thermoformed, or have the same thickness after the first sheet has been thermoformed in order to provide a composition which is encapsulated by a substantially 30 constant thickness of film.

In step (b) the container is at least partially filled with a composition. The container may be completely filled, or only partially filled, for example to leave 5 an air space from 2 to 20 %, especially from 5 to 10%, of the volume of the container immediately after it is formed.

The nature of the composition is not limited. It may, 10 for example, be a solid or a liquid. If it is in the form of a solid it may, for example, be in the form of a powder, granules, an extruded tablet, a compressed tablet or a solidified gel. If it is in the form of a liquid it may be optionally thickened or gelled with a 15 thickener or a gelling agent. One or more than one phase may be present. For example the container may be filled with a liquid composition and a separate solid composition, for example in the form of a ball, pill or speckles. Alternatively two or more solid phases, or two 20 or more immiscible liquid phases, may be present.

Thus the composition need not be uniform. For example, during manufacture the container could first be filled with a settable composition, for example a gel and then 25 with a different composition. Each of the compositions is independently aqueous. The first composition could dissolve slowly, for example in a washing process, so as to deliver it over a long period. This might be useful, for example, to provide an immediate, delayed or 30 sustained delivery of a component such as a softening agent.

- 10 -

If the water-soluble container is soluble in cold water at room temperature (20°C) or slightly above, it is important to ensure that the composition itself does not

5 dissolve the container. In general solid compositions will not attack the container, and neither will liquid organic compositions which contain less than around 5% of water as described, for example, in WO 92/17382. If the composition is in the form of a liquid containing

10 more than about 5 wt% water, action must be taken to ensure that the composition does not attack the walls of the container. Steps may be taken to treat the inside surface of the film, for example by coating it with an agent such as PVdC (poly(vinylidene dichloride)) or PTFE

15 (polytetrafluoroethylene). A semi-permeable or partial water barrier such as polyethylene or polypropylene or a hydrogel such as a polyacrylate may also be provided as a coating. The coating will simply fall apart or dissolve or disperse into microscopic particles when the

20 container is dissolved in water. Steps may also be taken to adapt the composition to ensure that it does not dissolve the film. For example, it has been found that ensuring the composition has a high ionic strength or contains an agent which minimises water loss through

25 the walls of the container will prevent the composition from dissolving a PVOH film from the inside. This is described in more detail in EP-A-518,689 and WO 97/27743.

30 A component which releases a gas is added to the composition. This component may be added separately or

with the remaining components. Thus, for example, the component, or one of the components of a multi-component gas releasing system, may be added first and the remainder of the composition added afterwards. Another 5 possibility is that the components, or one of the components of a multi-component gas releasing system, may be added after the remainder of the composition. It is also possible for all of the components to be added together in a single composition.

10

The component which releases a gas may, for example, comprise a component or a mixture of two or more components which react in the presence of the contents of the container to release a gas. For example, when 15 water is present in the composition, two components which do not react when in solid form but which will react in the presence of water can be added, such as an acid and a carbonate or bicarbonate. An example of a suitable acid is citric acid. Examples of suitable 20 carbonates and bicarbonates are sodium and potassium carbonate and sodium and potassium bicarbonate.

Another possibility is that a component is added which is able to react with a component already present in the 25 composition contained in the container. For example, an acid may be present within the composition held within the container, and a carbonate or bicarbonate as described above subsequently added. Alternatively a carbonate or bicarbonate may be present in the 30 composition, and an acid subsequently added.

In the above cases, the component which releases a gas may be added in solid form or in a solvent such as water or an organic solvent. The rate of release of the gas may be controlled. For example, a finely divided powder 5 will release the gas quicker than a compressed tablet. If desired, the component may be encapsulated by a substance which delays the release of the gas.

A further possibility is to add a component to the 10 composition which is a gas at room temperature (20° C) but which, at the time which it is added, is in the form of a solid or liquid because it has been cooled to less than its melting or boiling point. For example, solid carbon dioxide (dry ice) may be added. As the component 15 heats up to room temperature, which may occur naturally or be aided with heating, it will boil or sublime into a gas. Another possibility is to add a compound which is thermally unstable; for example sodium bicarbonate will release carbon dioxide when it is heated to about 60°C.

20 The component which releases a gas may, for example, be a component which gradually releases a gas such as a bleach, in particular an oxygen bleach or a chlorine bleach. Such bleaches gradually releases a gas such as 25 oxygen or a chlorine containing compound when they contact water. The water may itself be contained in the composition, be contained in another compartment and diffuse through the dividing wall into the compartment holding the bleach, or may diffuse into the composition 30 from outside the container.

Any component or combination of components can be used which will produce a gas. The gas should be non-toxic or produced in small quantities. It is most convenient, however, to produce carbon dioxide gas since this will
5 not cause any environmental concerns.

After the component which releases a gas has been added, for example with or to the composition, the container is sealed in step (c). If the component which releases a
10 gas starts to release a gas immediately, as it generally will, the container should be sealed immediately to ensure that at least some of the gas produced is retained within the container. Sealing can be carried out by any means as described above.

15

Thus, for example, if the container is in the form of a pocket formed from one or two sheets of film, the container may be sealed by heat-sealing or by any of the remaining sealing methods discussed above. The films
20 may be sealed together, for example by heat sealing, across the flange. A suitable heat sealing temperature is, for example, 120 to 195°C, for example 140 to 150°C. A suitable sealing pressure is, for example, from 250 to 800 kPa. Examples of sealing pressures are 276 to 552
25 kPa (40 to 80 p.s.i.), especially 345 to 483 kPa (50 to 70 p.s.i.) or 400 to 800 kPa (4 to 8 bar), especially 500 to 700 kPa (5 to 7 bar) depending on the heat sealing machine used. Suitable sealing dwell times are at least 0.4 seconds, for example 0.4 to 2.5 seconds.
30 Other methods of sealing the films together may be used, for example infra-red, radio frequency, ultrasonic,

laser, solvent, vibration, electromagnetic, hot gas, hot plate, insert bonding, fraction sealing or spin welding. An adhesive such as water or an aqueous solution of PVOH may also be used. The adhesive can be applied to the 5 films by spraying, transfer coating, roller coating or otherwise coating, or the films can be passed through a mist of the adhesive. The seal desirably is also water-soluble. The second film may, for example, comprise PVOH.

10

If more than one container is formed at the same time, the packaged compositions may then be separated from each other. Alternatively, they may be left conjoined and, for example, perforations provided between the 15 individual containers so that they can be easily separated at a later stage, for example by a consumer. If the containers are separated, the flanges may be left in place. However, desirably the flanges are partially removed in order to provide an even more attractive, 20 three-dimensional appearance. Generally the flange remaining should be as small as possible for aesthetic purposes while bearing in mind that some flange is required to ensure the two films remain adhered to each other. A flange of 1 mm to 10 mm is desirable, 25 preferably 2 mm to 7 mm, more preferably 4 mm to 6 mm, most preferably about 5 mm.

The containers are then allowed to inflate in step (d). The containers may be allowed to inflate, for example, 30 at rest, or they may be packaged into boxes for retail sale, and left to inflate in the boxes. The containers

- 15 -

may themselves be packaged in outer containers if desired, for example, non-water-soluble containers which are removed before the water-soluble containers are used.

5

The containers of the present invention generally contain from 5 to 100 g of composition, such as an aqueous composition, especially from 15 to 40 g, depending on their intended use. For example, a

10 dishwashing composition may weigh from 15 to 20 g, a water-softening composition may weigh from 25 to 35 g, and a laundry composition may weigh from 10 to 40 g, especially 20 to 30 g or 30 to 40 g.

15 The containers may have any shape. For example they can take the form of an envelope, sachet, sphere, cylinder, cube or cuboid, i.e. a rectangular parallelepiped whose faces are not all equal. In general, because the containers are not rigid and are inflated, the sides are

20 not planar, but rather are convex. If the container is formed from a thermoformed film and a planar film, the seam between the two films will appear nearer one face of the container rather than the other. Apart from the deformation of the container due to the generation of

25 gas, deformation may also occur at the stage of manufacture if desired. For example, if the pocket is filled with a gelled composition having a height greater than that of the pocket, the second film will be deformed when placed on top of the pocket.

In general the maximum dimension of the filled part of the container (excluding any flanges) is 5 cm. For example, a rounded cuboid container may have a length of 1 to 5 cm, especially 3.5 to 4.5 cm, a width of 1.5 to 5 3.5 cm, especially 2 to 3 cm, and a height of 1 to 2.5 cm, especially 1 to 2 cm, for example 1.25 to 1.75 cm.

The composition filling the containers is not particularly limited. It can be any composition which 10 is to be added to an aqueous system or used in an aqueous environment. Suitable compositions are fabric care, surface care and dishwashing compositions. For example, the composition may comprise a dishwashing, water-softening, laundry or detergent composition or a 15 rinse aid. In this case it is especially suitable for use in a domestic washing machine such as a laundry washing machine or a dishwashing machine. The container may also comprise a disinfectant, antibacterial or antiseptic composition intended to be diluted with water 20 before use, or a concentrated refill composition, for example for a trigger-type spray used in domestic situations. Such a composition can simply be added to water already held in the spray container. Examples of surface care compositions are those used to clean, treat 25 or polish a surface. Suitable surfaces are, for example, household surfaces, such as worktops, as well as surfaces of sanitary ware, such as sinks, basins and lavatories.

30 Examples of anionic surfactants are straight-chained or branched alkyl sulfates and alkyl polyalkoxylated

- 17 -

sulfates, also known as alkyl ether sulfates. Such surfactants may be produced by the sulfation of higher C₈-C₂₀ fatty alcohols.

5 Examples of primary alkyl sulfate surfactants are those of formula:



wherein R is a linear C₈-C₂₀ hydrocarbyl group and M is a water-solubilising cation. Preferably R is C₁₀-C₁₆ alkyl, 10 for example C₁₂-C₁₄, and M is alkali metal such as lithium, sodium or potassium.

Examples of secondary alkyl sulfate surfactants are those which have the sulfate moiety on a "backbone" of 15 the molecule, for example those of formula:



wherein m and n are independently 2 or more, the sum of m+n typically being 6 to 20, for example 9 to 15, and M is a water-solubilising cation such as lithium, sodium 20 or potassium.

Especially preferred secondary alkyl sulfates are the (2,3) alkyl sulfate surfactants of formulae:

25 $\text{CH}_2(\text{CH}_2)_x(\text{CHOSO}_3^- \text{M}^+) \text{CH}_3$ and

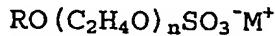


for the 2-sulfate and 3-sulfate, respectively. In these 30 formulae x is at least 4, for example 6 to 20,

- 18 -

preferably 10 to 16. M is cation, such as an alkali metal, for example lithium, sodium or potassium.

Examples of alkoxylated alkyl sulfates are ethoxylated
5 alkyl sulfates of the formula:



wherein R is a C₈-C₂₀ alkyl group, preferably C₁₀-C₁₈ such
10 as a C₁₂-C₁₆, n is at least 1, for example from 1 to 20, preferably 1 to 15, especially 1 to 6, and M is a salt-forming cation such as lithium, sodium, potassium, ammonium, alkylammonium or alkanolammonium. These compounds can provide especially desirable fabric
15 cleaning performance benefits when used in combination with alkyl sulfates.

The alkyl sulfates and alkyl ether sulfates will generally be used in the form of mixtures comprising
20 varying alkyl chain lengths and, if present, varying degrees of alkoxylation.

Other anionic surfactants which may be employed are salts of fatty acids, for example C₈-C₁₈ fatty acids, especially the sodium, potassium or alkanolammonium salts, and alkyl, for example C₈-C₁₈, benzene sulfonates.

Examples of nonionic surfactants are fatty acid alkoxylates, such as fatty acid ethoxylates, especially
30 those of formula:



- 19 -

wherein R is a straight or branched C₈-C₁₆ alkyl group, preferably a C₉-C₁₅, for example C₁₀-C₁₄ or C₁₂-C₁₄, alkyl group and n is at least 1, for example from 1 to 16,

5 preferably 2 to 12, more preferably 3 to 10.

The alkoxylated fatty alcohol nonionic surfactant will frequently have a hydrophilic-lipophilic balance (HLB) which ranges from 3 to 17, more preferably from 6 to 15,

10 most preferably from 10 to 15.

Examples of fatty alcohol ethoxylates are those made from alcohols of 12 to 15 carbon atoms and which contain about 7 moles of ethylene oxide. Such materials are

15 commercially marketed under the trademarks Neodol 25-7 and Neodol 23-6.5 by Shell Chemical Company. Other useful Neodols include Neodol 1-5, an ethoxylated fatty alcohol averaging 11 carbon atoms in its alkyl chain with about 5 moles of ethylene oxide; Neodol 23-9, an
20 ethoxylated primary C₁₂-C₁₃ alcohol having about 9 moles of ethylene oxide; and Neodol 91-10, an ethoxylated C₉-C₁₁ primary alcohol having about 10 moles of ethylene oxide.

25 Alcohol ethoxylates of this type have also been marketed by Shell Chemical Company under the Dobanol trademark. Dobanol 91-5 is an ethoxylated C₉-C₁₁ fatty alcohol with an average of 5 moles ethylene oxide and Dobanol 25-7 is an ethoxylated C₁₂-C₁₅ fatty alcohol with an average of 7
30 moles of ethylene oxide per mole of fatty alcohol.

- 20 -

Other examples of suitable ethoxylated alcohol nonionic surfactants include Tergitol 15-S-7 and Tergitol 15-S-9, both of which are linear secondary alcohol ethoxylates available from Union Carbide Corporation. Tergitol 15-S-7 is a mixed ethoxylated product of a C₁₁-C₁₅ linear secondary alkanol with 7 moles of ethylene oxide and Tergitol 15-S-9 is the same but with 9 moles of ethylene oxide.

10 Other suitable alcohol ethoxylated nonionic surfactants are Neodol 45-11, which is a similar ethylene oxide condensation products of a fatty alcohol having 14-15 carbon atoms and the number of ethylene oxide groups per mole being about 11. Such products are also available

15 from Shell Chemical Company.

Further nonionic surfactants are, for example, C₁₀-C₁₈ alkyl polyglycosides, such as C₁₂-C₁₆ alkyl polyglycosides, especially the polyglucosides. These

20 are especially useful when high foaming compositions are desired. Further surfactants are polyhydroxy fatty acid amides, such as C₁₀-C₁₈ N-(3-methoxypropyl) glyciamides and ethylene oxide-propylene oxide block polymers of the Pluronic type.

25 Examples of cationic surfactants are those of the quaternary ammonium type.

Examples of amphoteric surfactants are C₁₀-C₁₈ amine

30 oxides and the C₁₂-C₁₈ betaines and sulfobetaines.

- 21 -

The total content of surfactants in the composition is desirably 0.1 to 95 wt%, especially 60 or 75 to 90 wt%. The total content of surfactants in a laundry or detergent composition is desirably 60 to 95 wt%,

5 especially 70 to 90 wt%. Desirably, especially in a laundry composition, an anionic surfactant is present in an amount of 50 to 75 wt%, a nonionic surfactant is present in an amount of 5 to 20 wt%, a cationic surfactant is present in an amount of from 0 to 10 wt%

10 and/or an amphoteric surfactant is present in an amount from 0 to 10 wt%. Desirably, in a dishwashing composition, the anionic surfactant is present in an amount of from 0.1 to 50 wt%, a non-ionic surfactant is present in an amount of 0.5 to 20 wt% and/or a cationic

15 surfactant is present in an amount of from 1 to 15 wt%. These amounts are based on the total solids content of the composition, i.e. excluding any water or solvent which may be present.

20 The compositions, particularly when used as laundry washing or dishwashing compositions, may also comprise enzymes, such as protease, lipase, amylase, cellulase and peroxidase enzymes. Such enzymes are commercially available and sold, for example, under the registered

25 trade marks Esperase, Alcalase, Savinase, Termanyl, Lipolase and Celluzyme by Novo Industries A/S and Maxatasc by International Biosynthetics, Inc. Desirably the enzymes are present in the composition in an amount of from 0.5 to 3 wt%, especially 1 to 2 wt%.

The compositions may, if desired, comprise a thickening agent or gelling agent. Suitable thickeners are polyacrylate polymers such as those sold under the trade mark CARBOPOL, or the trade mark ACUSOL by Rohm and Haas Company. Other suitable thickeners are xanthan gums. The thickener, if present, is generally present in an amount of from 0.2 to 4 wt%, especially 0.5 to 2 wt%.

Dishwasher compositions usually comprise a detergency builder. Suitable builders are alkali metal or ammonium phosphates, polyphosphates, phosphonates, polyphosphonates, carbonates, bicarbonates, borates, polyhydroxysulfonates, polyacetates, carboxylates and polycarboxylates such as citrates. The builder is desirably present in an amount of up to 90 wt%, preferably 15 to 90 wt%, more preferably 15 to 75 wt%, relative to the total content of the composition. Further details of suitable components are given in, for example, EP-A-694,059, EP-A-518,720 and WO 99/06522.

The compositions can also optionally comprise one or more additional ingredients. These include conventional detergent composition components such as further surfactants, bleaches, bleach enhancing agents, builders, suds boosters or suds suppressors, anti-tarnish and anti-corrosion agents, organic solvents, co-solvents, phase stabilisers, emulsifying agents, preservatives, soil suspending agents, soil release agents, germicides, phosphates such as sodium tripolyphosphate or potassium tripolyphosphate, pH adjusting agents or buffers, non-builder alkalinity

- 23 -

sources, chelating agents, clays such as smectite clays, enzyme stabilizers, anti-limescale agents, colourants, dyes, hydrotropes, dye transfer inhibiting agents, brighteners and perfumes. If used, such optional 5 ingredients will generally constitute no more than 10 wt%, for example from 1 to 6 wt%, of the total weight of the compositions.

The builders counteract the effects of calcium, or other ion, water hardness encountered during laundering or 10 bleaching use of the compositions herein. Examples of such materials are citrate, succinate, malonate, carboxymethyl succinate, carboxylate, polycarboxylate and polyacetyl carboxylate salts, for example with alkali metal or alkaline earth metal cations, or the 15 corresponding free acids. Specific examples are sodium, potassium and lithium salts of oxydisuccinic acid, mellitic acid, benzene polycarboxylic acids, C₁₀-C₂₂ fatty acids and citric acid. Other examples are organic phosphonate type sequestering agents such as those sold 20 by Monsanto under the trade mark Dequest and alkylhydroxy phosphonates. Citrate salts and C₁₂-C₁₈ fatty acid soaps are preferred.

Other suitable builders are polymers and copolymers 25 known to have builder properties. For example, such materials include appropriate polyacrylic acid, polymaleic acid, and polyacrylic/polymaleic and copolymers and their salts, such as those sold by BASF under the trade mark Sokalan.

The builders generally constitute from 0 to 3 wt%, more preferably from 0.1 to 1 wt%, by weight of the compositions.

5 Compositions which comprise an enzyme may optionally contain materials which maintain the stability of the enzyme. Such enzyme stabilizers include, for example, polyols such as propylene glycol, boric acid and borax. Combinations of these enzyme stabilizers may also be
10 employed. If utilized, the enzyme stabilizers generally constitute from 0.1 to 1 wt% of the compositions.

Examples of bleaches are, for example, listed in WO 99/06522. These include oxygen releasing bleaching agents such as a hydrogen peroxide source and an organic
15 peroxyacid bleach precursor compound or, a preformed organic peroxyacid. Examples of hydrogen peroxide sources are inorganic perhydrate bleaches such as the alkali metal salts of perborate, percarbonate, perphosphate, persulfate and persilicates. Examples of
20 organic peroxyacid bleach precursors are listed in WO 99/06522. The bleaches also include chlorine releasing agents such as hydantoins, for example 1,3-dichloro-5,5-dimethyl hydantoin, hypochlorites such as sodium hypochlorite or dichloroisocyanurates such as sodium
25 dichloroisocyanurate.

The compositions may optionally comprise materials which serve as phase stabilizers and/or co-solvents. Examples are C₁-C₃ alcohols or diols such as methanol, ethanol,
30 propanol, and 1, 2-propanediol. C₁-C₃ alkanolamines such as mono-, di- and triethanolamines and

- 25 -

monoisopropanolamine can also be used, by themselves or in combination with the alcohols. The phase stabilizers and/or co-solvents can, for example, constitute 0 to 1 wt%, preferably 0.1 to 0.5 wt% of the composition.

5

If the composition is in liquid form, it may be anhydrous, or, for example, contain up to 5 wt% water. Aqueous compositions generally contain greater than 8 wt% water based on the weight of the aqueous 10 composition. Desirably the aqueous compositions contain more than 10 wt%, 15 wt%, 20 wt%, 25 wt% or 30 wt% water, but desirably less than 80 wt% water, more desirably less than 70 wt%, 60 wt%, 50 wt% or 40 wt% water. They may, for example, contain from 30 to 55 or 15 65 wt% water.

The compositions may optionally comprise components which adjust or maintain the pH of the compositions at optimum levels. Examples of pH adjusting agents are NaOH 20 and citric acid. The pH may be from, for example, 1 to 13, such as 8 to 11 depending on the nature of the composition. For example, a dishwashing composition desirably has a pH of 8 to 11, a laundry composition desirably has a pH of 7 to 9, and a water-softening 25 composition desirably has a pH of 7 to 9.

The present invention will now be further explained in the following Examples.

Example 1

A dishwashing composition was prepared by mixing together the following components in the weight

5 proportions indicated:

	Potassium tripolyphosphate powder	12%
	Sodium tripolyphosphate powder	30%
	Isothiazolinone	0.1%
10	Polyacrylate thickener (Carbopol)	1%
	Nonionic surfactant	0.5%
	Sodium citrate	10%
	Citric acid	0.2%
	Sodium bicarbonate	0.2%
15	Dehardened water	46%

A Multivac thermoforming machine operating at 6 cycles/min and at ambient conditions of 25°C and 35% RH ($\pm 5\%$ RH) was used to thermoform a PVOH film. This was Monosol M8534 obtained from Chris Craft Inc, Gary, Indiana, USA, having a degree of hydrolysis of 88% and a thickness of 100 μm . The PVOH film was thermoformed into a rectangular mould of 39 mm length, 29 mm width and 16 mm depth, with the bottom edges being rounded to a radius of 10 mm, at 115-118°C. The thus formed pocket 25 was filled with 10 ml of the dishwashing composition, and a 75 μm thick Monosol M8534 PVOH film was placed on top and heat sealed at 144-148°C. The thus produced containers were separated from each other by cutting the flanges. Each container attained a rounded appearance 30 due to the generation of carbon dioxide gas.

Example 2

The following formulations were prepared by mixing
5 together the indicated components in the weight
proportions indicated. In all instances the
compositions were filled into containers following the
procedure described in Example 1, and containers having
an attractive, rounded appearance were obtained after
10 the carbon dioxide gas had generated.

A laundry detergent composition:

	Sodium carbonate	20%
15	Nonylphenol ethoxylate	10%
	Accusol 820 obtainable from	
	Rohm and Hass Company	3.3%
	Sodium citrate	5%
	Citric acid	0.2%
20	Sodium bicarbonate	0.2%
	Dehardened water	61.3%

An automatic dishwasher detergent:

25	Sodium citrate	8%
	Van Gel ES thickener obtainable	
	from R.T.Vanderbilt Company	4%
	Tetrapotassium pyrophosphate	10%
30	Sodium tripolyphosphate	30%
	Anhydrous sodium metasilicate	2%

- 28 -

	Sodium xylene sulfonate	2.25%
	Deceth-4-phosphate	0.75%
	Citric acid	0.2%
	Sodium bicarbonate	0.2%
5	Dehardened water	42.6%

A slurry type heavy duty laundry liquid:

	Neodol 25-7 C ₁₂₋₁₅ linear alcohol	18%
10	Biosoft D-62 sodium alkylbenzenesulfonate	5.5%
	Sodium carbonate	2%
	Anhydrous sodium metasilicate	5%
	Tetrasodium pyrophosphate	20%
15	Sodium citrate	7.5%
	Carbopol ETDZ691 polymer obtainable from Goodrich	0.5%
	Citric acid	0.2%
	Sodium bicarbonate	0.2%
20	Dehardened water	41.1%

A slurry-type laundry detergent:

	Sodium carbonate	40%
25	Sodium citrate	4.8%
	Accusol 820 obtainable from Rohm and Hass	2%
	Accusol 810 obtainable from Rohm and Hass	5%
30	Sodium tripolyphosphate	10%
	Accusol 445 obtainable from	

- 29 -

	Rohm and Hass	2%
	Nonylphenol ethoxylate	10%
	Citric acid	0.25%
	Sodium bicarbonate	0.25%
5	Dehardened water	26.7%

A dishwashing composition:

	Accusol 810	11%
10	Accusol 445N	4%
	Sodium tripolyphosphate	20%
	Tetrapotassium pyrophosphate	10%
	Potassium silicate	29%
	Triton CF-32 alkylamine ethoxylate	3%
15	Potassium citrate	5%
	Citric acid	0.25%
	Sodium bicarbonate	0.25%
	Dehardened water	17.4%

CLAIMS

1. A process for producing an inflated, water-soluble container which comprises:
 - 5 a) forming an open container from a water-soluble film;
 - b) at least partially filling the container with a composition which comprises a component which releases a gas;
 - 10 c) sealing the container; and
 - d) allowing the container to inflate.
2. A process according to claim 1 wherein the container is at least partially filled with a composition and a component which releases a gas is subsequently added.
- 15
3. A process according to claim 1 wherein the container is filled with a composition which comprises a component which releases a gas in a single step.
- 20
4. A process according to any one of the preceding claims wherein step (a) comprises thermoforming the film to produce a pocket.
- 25
5. A process according to claim 4 wherein step (c) comprises placing a second water-soluble film on top of the filled pocket and sealing the films together.
6. A process according to any one of the preceding
- 30
- claims wherein the water-soluble film is a poly(vinyl alcohol) film.

7. A process according to any one of the preceding claim where the composition in step (b) is an aqueous or non-aqueous liquid.

5

8. A process according to claim 7 wherein the aqueous liquid contains greater than 8wt% water based on the total weight of aqueous liquid and component which releases a gas.

10

9. A process according to claim 7 or 8 wherein the component which releases a gas comprises a mixture of compounds which react in the presence of water to produce the gas.

15

10. A process according to claim 7 or 8 wherein the component which releases a gas comprises a compound which reacts with a compound in the aqueous liquid to produce the gas.

20

11. A process according to claim 10 wherein the component which releases a gas is a bleach.

25

12. A process according to claim 7 or 8 where the component which releases a gas is a component which is a gas at room temperature (20°C) but which is added in step (b) in the form of a cooled solid or liquid.

30

13. A process according to any one of the preceding claims wherein the gas which inflates the container

- 32 -

is carbon dioxide.

14. A process according to any one of the preceding
claims wherein the container comprises a fabric care,
5 surface care or dishwashing composition.

15. A process according to any one of the preceding
claims wherein the container comprises a
dishwashing, water-softening, laundry or detergent
10 composition or a rinse aid.

16. A process according to claim 15 wherein the
container is suitable for use in a domestic washing
machine.

15
17. A process according to any one of claims 1 to 14
wherein the container comprises a disinfectant,
antibacterial or antiseptic composition.

20 18. A process according to any one of claims 1 to 14
wherein the container comprises a refill
composition for a trigger-type spray.

19. An inflated water-soluble container comprising a
25 water-soluble film enclosing a liquid or solid
composition and a gas, wherein the gas is enriched
with at least one gaseous component as compared
with air or comprises at least one gaseous
component not normally present in air.

30
20. A container according to claim 19 wherein the

gaseous component is carbon dioxide.

21. A container according to claim 19 wherein the gaseous component is oxygen or a chlorine containing component.

5

22. A container according to any one of claims 19 to 21 wherein the water-soluble film is a poly(vinyl alcohol) film.

10

23. A container according to any one of claims 19 to 22 wherein the water-soluble film has been thermoformed to form a pocket and the pocket has been sealed by placing a second water-soluble film 15 over the pocket and sealing the films together.

24. A container according to any one of claims 19 to 23 wherein the water-soluble film has been thermoformed.

20 25. A container according to any one of claims 19 to 24 wherein the composition is a fabric care, surface care or dishwashing composition.

25 26. A container according to any one of claims 19 to 25 wherein the composition is a dishwashing, water-softening, laundry or detergent composition or is a rinse aid.

27. A container according to claim 26 which is suitable 30 for use in a domestic washing machine.

- 34 -

28. A container according to any one of claims 19 to 25

wherein the composition is a disinfectant,

antibacterial or antiseptic composition.

29. A container according to any one of claims 19 to 25

5 wherein the composition is a refill composition for
a trigger-type spray.

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 B65B9/04 B65B3/00 B65D65/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 B65B B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 621 483 A (MAGID DAVID J) 11 November 1986 (1986-11-11)	1-3, 5-7, 9, 10, 13, 18-20, 22, 29
Y	column 2, line 37 -column 4, line 39 column 6, line 9 -column 10, line 68; figures	4, 8, 14-17, 23-28
X	EP 0 524 721 A (RHONE POULENC AGROCHIMIE) 27 January 1993 (1993-01-27) page 2, line 1 -page 5, line 56; claims	1, 2, 7, 9, 17, 28
Y	EP 0 608 910 A (RHONE POULENC AGRICULTURE) 3 August 1994 (1994-08-03) column 2, line 48 -column 6, line 21	4, 17, 23, 24, 28
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

22 November 2001

Date of mailing of the international search report

30/11/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl
Fax (+31-70) 340-3016

Authorized officer

Jagus1ak, A

C.(Continuation) DOCUMENTS CONSIDERED RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 94 14941 A (BEROL NOBEL AB ;BERTILSSON BO (SE); CASSEL EVA (SE)) 7 July 1994 (1994-07-07) page 11, line 1 -page 12, line 23	8,14,15, 25,26
Y	US 4 973 416 A (KENNEDY SHAUN P) 27 November 1990 (1990-11-27) page 1, line 6 -page 8, line 27	16,27

INTERNATIONAL SEARCH REPORT

PCT/GB 01/03825

Patent document cited in search report		Application date	Patent family member(s)	Publication date
US 4621483	A	11-11-1986	US 4478044 A AU 543492 B2 AU 8533882 A BR 8204392 A CA 1188273 A1 DE 3272880 D1 DE 3279341 D1 DE 3280391 D1 EP 0071733 A2 EP 0171556 A1 EP 0296388 A1 ES 514722 D0 ES 8400331 A1 ES 521156 D0 ES 8403820 A1 ES 521157 D0 ES 8500172 A1 ES 532495 D0 ES 8504058 A1 IE 54616 B1 IE 54617 B1 IL 66180 A IL 74618 A JP 7025387 B JP 58112979 A KR 8901506 B1 MX 161752 A	23-10-1984 18-04-1985 10-02-1983 19-07-1983 04-06-1985 02-10-1986 16-02-1989 05-03-1992 16-02-1983 19-02-1986 28-12-1988 16-10-1983 16-01-1984 01-04-1984 01-07-1984 01-10-1984 01-01-1985 01-04-1985 01-07-1985 20-12-1989 20-12-1989 16-09-1987 16-09-1987 22-03-1995 05-07-1983 06-05-1989 20-12-1990
EP 0524721	A	27-01-1993	US 5139152 A AP 407 A AP 445 A AP 442 A AT 183614 T AU 664996 B2 AU 1802392 A AU 664997 B2 AU 1809192 A AU 664998 B2 AU 1809292 A BR 9202306 A BR 9202307 A BR 9202308 A CA 2071075 A1 CA 2071076 A1 CA 2071077 A1 CN 1067859 A CN 1067630 A CN 1067629 A CS 9201758 A3 CS 9201759 A3 CS 9201760 A3 DE 69229849 D1 EP 0524721 A1 EP 0518629 A1 EP 0522713 A1 FI 922681 A FI 922682 A FI 922683 A	18-08-1992 25-09-1995 12-01-1996 12-12-1995 15-09-1999 14-12-1995 24-12-1992 14-12-1995 17-12-1992 14-12-1995 17-12-1992 05-01-1993 05-01-1993 05-01-1993 12-12-1992 12-12-1992 12-12-1992 13-01-1993 06-01-1993 06-01-1993 16-12-1992 16-12-1992 16-12-1992 30-09-1999 27-01-1993 16-12-1992 13-01-1993 12-12-1992 12-12-1992 12-12-1992

INTERNATIONAL SEARCH REPORT

PCT/GB 01/03825

Patent document cited in search report	Application date	Patent family member(s)	Publication date
EP 0524721	A	IE 921879 A1 IE 921880 A1 IE 921881 A1 IL 102128 A JP 5155705 A JP 5155704 A JP 5155708 A MX 9202757 A1 MX 9202759 A1 MX 9202762 A1 NZ 243094 A NZ 243095 A NZ 243096 A US 5280835 A US 5624034 A ZA 9204232 A ZA 9204233 A ZA 9204234 A AP 346 A	16-12-1992 16-12-1992 16-12-1992 16-10-1996 22-06-1993 22-06-1993 22-06-1993 31-05-1994 31-05-1994 31-05-1994 22-12-1994 27-09-1994 27-09-1994 25-01-1994 29-04-1997 31-03-1993 31-03-1993 31-03-1993 28-07-1994
EP 0608910	A 03-08-1994	EP 0608910 A1 GR 3024643 T3 AP 348 A AT 154564 T AT 154565 T AU 663492 B2 AU 1533492 A BR 9205858 A CA 2107341 A1 CN 1065436 A ,B CZ 9302063 A3 DE 69220483 D1 DE 69220483 T2 DE 69220501 D1 DE 69220501 T2 DK 577693 T3 DK 608910 T3 EP 0577693 A1 ES 2104906 T3 ES 2106388 T3 FI 934354 A WO 9217382 A1 GR 3024463 T3 HU 65226 A2 IE 921094 A1 IL 101490 A JP 6506173 T MX 9201538 A1 NZ 242248 A PL 171812 B1 PT 100349 A RU 2099260 C1 SK 107493 A3 TR 27730 A ZA 9202467 A	03-08-1994 31-12-1997 28-07-1994 15-07-1997 15-07-1997 12-10-1995 02-11-1992 28-06-1994 06-10-1992 21-10-1992 16-03-1994 24-07-1997 15-01-1998 24-07-1997 05-02-1998 05-01-1998 29-12-1997 12-01-1994 16-10-1997 01-11-1997 26-11-1993 15-10-1992 28-11-1997 02-05-1994 07-10-1992 15-03-1995 14-07-1994 01-10-1992 27-01-1995 30-06-1997 29-04-1994 20-12-1997 08-06-1994 28-06-1995 31-03-1993
WO 9414941	A 07-07-1994	SE 9203818 A WO 9414941 A1	19-06-1994 07-07-1994

INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/GB 01/03825

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4973416	A 27-11-1990	JP 2155999 A	15-06-1990